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an egg by many old authors, and was made the type of the genus *Achlysia* by Audouin.

The adult swims actively about in the water, but before attaining maturity fixes to some plant and undergoes another molt without material change of form.

*Hydrachna belostomæ* Riley.—*Larva*. Hexapodous. Elliptic-ovoid. Pale red, with two dusky eye-spots. Legs 6-jointed including coxæ; terminal joint longest; claws very small. Surface closely and evenly studded with minute points. Palpi drawn beneath the head with the second joint greatly swollen, and showing like an eye at each anterior side of the body; the three terminal joints indistinctly separated and each armed with a sharp hook. Becoming elongate and more or less pyriform, with a distinct neck when fixed. *Pupa* formed within the bag-like body of larva. *Adult*—Average length when first from pupa 1.5 mm.; globular; color dark blood brown; body smooth; legs with but few hairs, terminal joint truncate and with two very minute claws; palpal claws very small and the thumb no longer.

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## THE HOME OF THE HARPY-EAGLE.

BY FELIX L. OSWALD, M.D.

NOT far from the old military road which unites the Mexican seaport of Tehuantepec with the cities of the table-land, there stands an ancient Spanish fort, *El Fortin de Tarija*, which is now used as a storehouse by the proprietors of a neighboring copper-mine, while one of the larger outbuildings has been converted into a tavern, where the stage coach stops for dinner. *Posada de dos mares*, Hotel of the two seas, seems rather a strange name for a posada situated in the heart of the Sierras, and at an elevation of at least twelve thousand feet above the level of any sea, but if the traveler deigns to alight and share the *table d'hôte* of the humble posadero he may convince himself that the name is not so very inappropriate after all.

"Forty minutes time before the coach starts Señor," my host will observe after dinner, "and if you never passed here before, perhaps you would like me to accompany you to the Fort and show you the *alta vista*, the grand view, from the parapet."

"Grand view? is there anything exceptionally grand about it?"

"Yes, sir, it is the grandest view in America, for you can see

*los dos mares*, the two oceans, at the same time! I only charge you one real (twelve cents) extra."

He who has never seen two oceans at the same time will very likely invest a real. The view is grand indeed. You stand on the back-bone of the American continent, which measures less than two hundred English miles from shore to shore here, and see the Gulf of Mexico so plainly that you might distinguish the smoke-trail of the New Orleans packet, or the glittering towers of St. Juan de Ulloa, while the Pacific, though thirty or forty miles nearer, glistens faintly through a gap of the Chiapas coast-hills, and but for the sharp-drawn line of its horizon might be mistaken for a mountain lake. Yet it is not the water that constitutes the grandeur of the *alta vista*, it is the land, the mainland of the western world, of which you see a larger and fairer portion from the parapet of Fort Tarija, than from perhaps any other point between Mount St. Elias and the Peak of Aconcagua. Far from the north, from the distant border state of Sonora, descends a mountain chain which is easily recognized as the Sierra Madre, the main and central chain of the American continent, the southern prolongation of the Rocky mountains of New Mexico and Colorado. A second Sierra, a continuation of the California Contra-costa range, lifts itself in the north-western sky, and may from here be traced through a succession of fainter but snowier summits that seem to rise with the distance, till they culminate in a stupendous peak, the extinct volcano of Culiacan, which looms like a jagged white cloud over the edge of the horizon. About ten leagues, or thirty English miles, from the Fort the two Sierras unite, and between their icy ridges, their wild crags and their forests of evergreen pines enclose a mountain-land which is perhaps, after all, the true paradise of the western hemisphere.

From the regions of eternal snow to the lakes and fruit-groves in the valleys that communicate with the primeval forests of the *tierra caliente*, this vast triangular terrace-land, the great mountain valley of Oaxaca, exhibits every degree of elevation, the climatic extremes with all their intermediate grades and almost every variety of the American fauna and flora. On a surface of six thousand English square miles the eastern half of the state of Oaxaca unites a greater abundance and variety of animal and vegetable life than any other American country of equal extent,

and the exuberant fertility of its lower valleys is only equaled by the coast regions of the Sunda islands. Life seems intensified here. The mightiest trees and the strongest animals, as well as the sweetest fruits and most brilliant birds, are found together in this garden of the Hesperides, which (from all but a political standpoint) would appear, even to a patriotic Yankee, as superior to the finest portions of the United States as the hill counties of Southern Tennessee are superior in beauty and fertility to the most favored districts of Labrador.

Between the two main forks of the Rio Verde, and within a circuit of fifty English miles, the naturalist may find from sixty to seventy-five different species of palm trees, wild growing oranges, figs and almonds, four varieties of the *Musa paradisiaca*; the Adansonia and the dragon-tree, with their gigantic trunks, the most gorgeous butterflies, the largest reptiles and Carnivora of the New World, including the *Boa imperator* and the jaguar, and the strongest if not the largest of all American birds, for the forests of Southern Mexico are the favorite home of the Harpy-Eagle, the king bird of our western continent.

Even animals of a wide latitudinal distribution show an elective affinity for some special country which may have been their "centre of creation," and has always remained their favorite abode, where they will survive after their species has become extinct in other lands, and which may, therefore, be called their home *par excellence*. The tiger is thus at home in the Sunderbunds of the Ganges Delta, the bustard (*Otis tarda*) on the plains of Southern Russia, the flying squirrel in the Southern Alleghanies, and the prairie dog in North-western Texas, near the head waters of the Red River. The harpy-eagle (*Harpyia destructor*) has been shot in the mountains of South-western Bolivia, in the Mornes du Diable of St. Domingo and in the valleys of Southern California; but a hunter may range those regions for years without getting a chance to add to his trophies the feather coronet of the *aguila real*, the king eagle, as the Spaniards call him, while every farmer's boy of an Oaxaca mountain village knows an eyrie or two in the neighboring crags, which he is ready to rob of its eaglets or large white eggs for a couple of reals. From the projecting rocks of the lower Sierra, on any bright morning of the year, one may see the hovering form of the destructor suspended in the clear sky or wheeling in ascending circles over the misty ocean of foliage,

and from March to the end of June the tree-tops of the *tierra caliente* resound with the screams of the ever-hungry eaglets.

In the spring of 1875, I sent a pair of callow harpies to Messrs. McAllister & Co., of Vera Cruz, who took them to Philadelphia the next year, where one of them is now, while the other found its way to New York. They were the first living birds of their species that ever reached our Eastern States, I believe, with the exception of a wounded old hen-harpy of extraordinary size, that was shot and captured near Tampico by Colonel Godolitz, of the Austro-Mexican army, who took her to St. Louis, Mo., where she died soon after her arrival, either from her wounds or from the effects of the climate. A so-called harpy, which is kept in the Zoölogical Garden of Munich, I found to be a Brazilian eagle (*Polyborus tharus*), which, properly speaking, is no eagle at all, but like the *Lämmergeyer* of Switzerland, a compromise between the *Falconidæ* and vultures. None of the repeated attempts to carry the genuine harpy-eagle to Northern Europe has succeeded, as far as I know; owing more probably to its sensitiveness to cold than to its impatience of captivity, for the *aguila real* is a common pet in the farmhouses of Southern and South-western Mexico.

On the hacienda de Tuxpan, the hereditary estate of the Santa Anna family, I saw among other curiosities a tame eagle, which had been kept in and near the house for upwards of twelve years, and had been so much indulged in all its whims that it had come to consider itself as a privileged member of the household. It was a fine specimen of the genuine crested king-eagle, and gave me the first opportunity to study the physical and moral peculiarities of the species.

The *Harpyia destructor* is well equipped for its trade. A square, strong head, armed with a most viciously curved, powerful bill, that can crush a man's finger-bones without any special effort and dislocate the neck of a squirrel-monkey by a single wrench; broad compact wings, moved by shoulder-muscles of enormous strength, and a pair of stout legs, feathered to below the tarsi, that terminate in claws of such extraordinary power and sharpness that they leave marks on the skin of a quadruped and even on the tough leather of a Mexican saddle like the bite of a wild-cat. The harpy is often killed for the sake of its feathers, I mean for the feather-bed value of its plumage, by the Mexican Indians,

and if plucked, yields about four pounds of soft, grayish-white down, beside the stiff wing and tail feathers and the bristling tuft which crowns its head. This plumage is so elastic, so compact, and so firmly imbricated that buckshot, striking the wings or the breast of the bird at a certain angle, glance off or fail to penetrate to vital parts; and monkeys or foxes which in their death struggle snap at what they mistake for the throat of their captor, shut their fangs upon a mass of elastic down, which baffles their efforts till the grip of the destructor closes upon their own throats. The harpy can overtake the swiftest birds of the tropical woods, and, in spite of its size, steers its way through the labyrinth of forest trees and hanging vines with amazing skill, and rarely fails to rise with a pheasant, a woodcock or a small mammal in its claws after plunging like a meteor from the clouds into the leafy maze of the *tierra caliente*.

The full-grown eagle walks in stiff grandezza, with its head erect and its crop thrown out, after the manner of strutting turkey-cocks, except, if charging an enemy, when he lowers his head like a vicious buck, half opens his wings and rushes to the encounter with a succession of flopping jumps. The old hen-harpy measures about three feet from its crest to the base of the tail, and from six to seven feet with outstretched wings. The male is somewhat smaller, but the strength of the bird in proportion to its size is altogether abnormal. It has been said that a bulldog is readier to fight an antagonist of superior bulk than any other animal; and speaking merely of the courage to attack a foe without regard to his size, this is probably true, for, at the bidding of its master, an English bull-terrier will charge a beagle or a bear with equal promptitude, but if we speak of the ability to vanquish as well as to assail larger animals the first prize belongs indisputably to the *Harpyia destructor*.

The *lobo volante*, or winged wolf, as Quesada translates the old Aztec name of the harpy, attacks and kills heavy old turkey-cocks, young fawns, sloths, full-grown foxes and badgers, middle sized pigs and even the black Sapayou monkey (*Ateles paniscus*), whose size and weight exceed its own more than three times. The old eagle on the hacienda de Tuxpan engaged, not in a friendly bout, but in mortal combat, the big shepherd's dog of a neighboring farmer who visited the hacienda now and then, and was only vanquished by a second dog that came to the aid of

his brother. The colly, who looked as if he had encountered a pack of wolves, managed to limp off, but on his way home dropped by the roadside, *exsanguis*, and a *post-mortem* examination showed that he had bled to death from a deep gash in his throat, that one of his eyes had been torn out, and that in the fight of ten minutes the bones of his skull and breast had been laid open in as many different places.

At the return of President Juarez to the Mexican capital in 1867, the festive bull-fights were supplemented by various side-shows, and in the vestibule of the Grand Arena a pugnacious old cock-harpy was pitted against a Mexican lynx (*Felis onca*), which had been crippled by a shot through its haunches, but was otherwise in good fighting trim and very much inclined to take satisfaction out of somebody. The bird was torn to pieces; but the mammal did not survive him many minutes, having been literally flayed from its shoulders to the tip of its nose.

Professor Buckley, State Geologist of Texas, told me that he shot a harpy in the jungle-delta of the Rio Grande, but failed to capture it, though both its wings were broken and the blood issuing from its beak gave proof of severe internal injuries. In this crippled condition the bird kept the dogs at bay by turning on its back and presenting its claws after the manner of a wounded cat, shuffling off at the same time by an alternate movement of its neck and tail, till it reached the edge of the jungle, into which it disappeared before the hunter had reloaded his shot-gun.

The organ of vitality, which, according to Lavater's definition, inspires a tenacious adherence to life, must occupy a large portion of the harpy's brain, and enable it to survive injuries which would terminate the nine lives of the most vigorous tom-cat. No Mexican hunter of experience will waste ammunition by a long-range shot at a crested eagle, for unless the bullet shatters his head or breaks one of his wings, the bird flies off as if nothing had happened, though a cloud of feathers flying from his breast or abdomen may attest that the shot has not missed altogether. A Mexican miner who left the blast furnaces of St. Miguel, near Orizaba, before day-break one Sunday morning and descended the mountains by a short-cut, surprised a pair of harpies on their eyrie, and with a common cudgel knocked down one of them, which, either to scare the intruder or because it was scared out of its own wits, flew directly at his head. The bird flopped

among the boulders, but before it could take wing again, the miner put an end to its struggles with a few well-aimed whacks, and shouldering his game, resumed his road towards the valley settlements. Half-way down the hill he reached a steep cliff and shifted his burden to his left shoulder, to use his right arm to better advantage. But at the most critical moment of the dangerous descent he suddenly felt the claws of the eagle at his neck, and, in order to save himself, had to drop his stick, which fell down the cliffs and into the bed of a mountain torrent. Holding on to the bird with one hand, he managed to reach the foot of the precipice, where he seized the struggling captive by the legs, and swinging it up, dashed its head against a rock, till its convulsions had ceased entirely. His arrival in the village with the story of his adventure, created quite a sensation, but when the bird was deposited on the ground to be examined at leisure, it revived for the third time, struck its claws through the hand of its captor, struggled to its feet and would have escaped after all, if the enraged miner had not flung himself upon it, seized a rock and hammered its head to a jelly.

As soon as the lengthening days of the year approach the vernal equinox, the hen-harpy begins to collect dry sticks and moss, or perhaps only lichens with a few claws' full of the feathery bast of the Arauca palm, if her last year's eyrie has been left undisturbed. Her favorite roosting places, the highest forest trees, especially the *Adansonia* and the *Pinus balsamifera*, and the more inaccessible rocks of the foothills, are commonly also chosen for a breeding place, and it is not easy to distinguish her compact-built eyrie on the highest branches of a wild fig-tree from the dark-colored clusters of the Mexican mistletoe (*Viscum rubrum*), which frequents the same tree-tops. The eggs are white, with yellowish brown dots and washes, and about as long, though not quite as heavy, as a hen's egg. Of these eggs the harpy lays four or five, but never hatches more than two, or, if the Indians can be believed, feeds the first two eaglets that make their appearance with the contents of the remaining eggs. The process of incubation is generally finished by the middle of March, if not sooner; and from that time to the end of June the rapacity of the old birds is the terror of the tropical fauna, for their hunting expeditions which later in the year are restricted to the early morning hours, now occupy them for the larger part of the day.



From the garden-terrace of *El Pinal*, a little villa on the ridge of the Organos mountains, I frequently watched a pair of harpies that had their nest in the crags below. The hen-bird, which could be recognized by her larger size and the greater energy of her movements, generally made her appearance a few minutes before sunrise, mounted to the upper sky, as if to study the meteorological probabilities for the coming day, and then proceeded to business. After wheeling at an elevation of some hundred feet over the tree tops, in a circle or rather in a contracting spiral for a couple of minutes, she commonly would stop short, hover with quivering wings for a second or two, and then dive into the leafy ocean below, with a headlong rapidity that could hardly be followed by the eye, but evidently with a practical purpose, for her descents were generally succeeded by the ascent of a cloud of birds or the shrill piping of the squirrel-monkeys (*Callithrix sciureus*) and the exultant scream of the wild huntress from the depths of the forest. Then followed a pause, devoted to domestic duties, during which the thanksgiving duet of the eaglets ascended from the cliffs, and very soon after one or both parents reappeared in the upper air to resume the work of destruction.

The callow harpies, with their pendant crops, their misshapen big heads and their preposterous claws, resemble embryo demons or infantine chimeras rather than any creatures of nature, but they grow very rapidly and their appetite during the first six months of their existence is almost insatiable. The pair which I afterwards sent to Vera Cruz kept an Indian boy busy from morning to night, cleaning their cage and refilling their trough with a ragout of fish, pork and hominy. The exigencies of two or three harpy-nests to the square league, which I take to be the average ratio of their distribution would exhaust the food supply of any other region but that of a tropical jungle, and even there the eaglets would have to be stinted in the rainy season, if it was not for the harpy-eagles' impatience of any competition. His tyranny over the kingdom of the air tolerates no rival; the falcons and the *Aquila chrysaetos* have to confine themselves to the icy rocks of the upper Sierra, the *Strix bubo* and other owls are bound under heavy penalties to keep the peace during daylight and the sea-eagle is pursued for miles with implacable fury whenever he ventures to trespass upon the rivers of the *tierra caliente*.

Of all the *aquilinae*, the harpy is the only one that tolerates no interference with his business by jackdaws, jaybirds and other police agents of the woods. In his excursions to the upper mountain forests he is often attacked by swarms of the iris-crow, the sworn enemy of the falcon kind and all other *Raptores*; but, unlike the others, the harpy invariably turns upon his pursuers, and by capturing and tearing one or two, greatly moderates the zeal of the others.

In the choice of his game he shows a great latitude of taste and seems to devour with equal relish a fat iguana-lizard, a young woodcock or a tough old monkey. During the wet season, when pheasants won't break cover and squirrels stay at home, the *Harpyia destructor* may often be seen perched on some overhanging bough at the edge of a lagoon or large river, in wait for waterfowl. If you can watch him unobserved, you may see him get ready if the squawk of an approaching string of wood-ducks resounds from the depths of the everglades. He half opens his wings, bends his head up and down so as to put his perch into a rocking motion, and then leans forward like a catamount preparing for a spring. As soon as the unsuspecting mallards have passed his tree, he flings himself ahead, with wings laid back and claws ready for action and shoots like an arrow between the water surface and his game, thus getting them completely at his mercy. After rushing forward in blind obstreperous flight for a few hundred yards, the frightened ducks resign themselves to their instinct, which guides them waterwards; but before they touch the saving element the harpy is in their midst, with time enough and to spare, to make a judicious selection. He can catch fish, too; does not disdain the black watersnakes that glide through the shallow ponds of the coast-jungles, and even anticipates the trick of the tortoise hunters that uncover the oily eggs which the carey turtle has covered with the sand of the shallow river banks. But during the larger part of the year he seeks his quarry on the trees of his native woods, and causes more distress and dire commotion among the tribes of the gallinaceous tree birds, raccoons, frugivorous rodents and monkeys than all their other enemies taken together.

The upper branches of the tall mango trees which are visited by swarms of Sapajou monkeys during the fruit season, become the scene of a horrible hubbub if one of the wary quadrumana espies the hovering form of the arch-fiend, getting ready for the

first act of an oft-repeated tragedy, and gives the alarm signal by a coughing scream, followed by the yells and confused chattering of the entire party. They huddle together like a flock of frightened sheep, the mothers especially endeavoring to push their babies into the centre of the crowd ; but in the midst of the preparations the screech of some outpost gives the signal for a general *sauve-qui-peut*—the murderer is upon them, has grabbed some unlucky youngster between neck and skull and flies away, with the switching tail of the captive depending from between his claws, while the pitiful piping of the bereaved relatives mingles with the grunts of execration of the old patriarchs. The whole assembly then repairs to the upper branches for a chattering indignation meeting.

A struggling monkey generally throws its hands up, and by thus losing its hold upon the branches, gives the enemy a fatal advantage ; but the large bluish-gray squirrel of the Mexican woods (*Sciurus gigas*), if pounced upon so unawares that it has no time to regain its hole, either throws itself headlong to the ground or jumps toward a stout bough, takes hold with its four legs and four teeth at once and never loosens its grip while a spark of vitality remains in its claws or jaws. The harpy then either devours his prey *in situ*, by tearing piece after piece from the quick body, or relaxes its hold and takes wing for a moment, which often betrays the squirrel into the imprudence of letting go and taking a flying jump into space, in the hope of reaching the ground, where it would easily escape in the thick underbrush. Anticipating this, the eagle has perched upon a lower branch, with his wings half open, and intercepts the *salto mortale* by catching the jumper in mid-air.

During the sultry hours of the early afternoon the harpy-eagle participates in the general siesta, and may often be seen perched upon a lower branch of the *caucho* or some other dense shade-tree, alone or in company of his mate and the eaglets of the last brood. Swaying from side to side and crooning to himself in a sort of snoring or murmuring purr, he sits thus for hours, enjoying the sweets of digestion, till the lengthening shades and the reawakening voices of the forest summon him to supper or to one of those aerial excursions in which a pair of breeding harpies joins toward sunset as often as in the early morning hours.

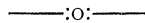
The Incas and Aztec noblemen trained harpy-eagles like

falcons, and preferred them to tame panthers, which were used by pot-hunters to capture deer and young peccaries. Devega, the biographer of Hernan Cortez, says that the satrap of a Mexican province presented the Great Captain with a hunting-eagle, called *El Hidalgo del aire*, the prince of the air, whose value was estimated at the price of ten slaves; and adds, that the only bodily injury which Cortez ever received during his adventures in Mexico, was inflicted by this eagle. The cruel Spaniard used to prick the bird with his dagger, because he would not obey the hood, *i. e.*, did not wait for the signal of attack, as the Castilian gerfalcons were taught to do, and once, when the eagle repeated this error and took wing without proper authority, the angry hunter sent a pistol ball after him, "to teach him manners." The shot cured him of his bad habits forever, for it broke his head, and the prince of the air tumbled down with his talons quivering in the death shudder. Cortez dashed his pistol to the ground and knelt down in the hope of saving the victim of his passion; but Hidalgo was booked for the happy hunting grounds. Three or four times he tried to rise to his feet, and then lay still, his strength ebbing away with his life blood. But before he resigned himself to death, he raised his head once more, grabbed the best finger of the right hand of his cruel master, and bit it through—crushed it completely, "so as not to leave the world unavenged," as Devega says.

The Princes of Tlascala wore the image of the crested eagle on their breasts and on their shields, as a symbol of royalty, and could not easily have chosen a fitter emblem. The *aquila real* does not wear his crown in vain, he is a true monarch and embodies all the ideal characteristics of a wild warrior. Proud, strong, swift, wary and bold to a surprising if not to a sublime degree, he meets no superior but the omnipotent biped that has not inappropriately been called the god of the animal world, and among the tribes of his own element he recognizes neither a chief nor a rival. The tropical forests between the Gulf of Mexico and the head-waters of the La Plata are his domain, and he has chosen his home well. There will be forests and game and wild liberty in those regions after the last wilderness between Texas and Labrador has disappeared and all Northern America is either a treeless waste, like Turkistan, or a hive of industry like Germany and Great Britain. The continuous woods that once cov-

ered Europe from Portugal to the foothills of Caucasus have disappeared, the mountains of Persia have become naked rocks and the promised land is a desert ; but the Sunda Islands, Southern India, Siam, Ethiopia and the birthland of the Nile are still as sylvan and as prolific of life as in the springtime of creation. Not only the ocean but the vegetation of the tropics can defy "the vile strength, which man for earth's destruction wields," and Macauley's New Zealander who might visit the desert relics of American cities after musing over the ruins of London, would still find the primeval forests that covered the southern part of our continent when Humboldt and Bonpland explored the valley of the Amazon.

"These forests will be felled," says De Tocqueville, speaking of the Calaveras cedar groves, "they will disappear as the cedars of Lebanon and the mountain-firs of Scotland have disappeared ; these and all other forests of the cold and temperate zones. The trees of the tropical woodlands are the only true evergreens on earth."



## ON LIKE MECHANICAL (STRUCTURAL) CONDITIONS AS PRODUCING LIKE MORPHOLOGICAL EFFECTS.

BY JOHN A. RYDER.

**A** PROPOS of the interest recently manifested in the matter of "the relation of animal motion to animal evolution,"<sup>1</sup> I have thought it pertinent to offer the following remarks. The possible morphological effects of like mechanical or structural conditions are illustrated in the vertebral axes of turtles and extinct armadilloes (*Hoplophoridae*), where the rigid exoskeleton (carapace) has caused the originally segmented axial skeleton to exhibit a strong tendency to revert to the primitive homogeneous (notochordal) condition, without at the same time losing its osseous character. The exoskeleton in both these groups has assumed in part the function of the chitinous exoskeleton of articulates. The vertebral axis relieved in both instances from the transverse flexures incident to locomotion and respiration, has coössified into a solid bony bar, or rather a hollow tube, with loss of the cylindroid form of centrum. The vertebral centra are in both represented

<sup>1</sup> See E. D. Cope in this Journal for January, 1878.